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INTELLIGENCE MEMORANDUM

ESTIMATES OF COSTS IN RUBLES OF BUILDING VARIOUS TYPES OF MERCHANT SHIPS IN THE USSR

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WARNING

THIS MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, USC, SECS. 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

CENTRAL INTELLIGENCE AGENCY

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FOREWORD

This memorandum includes the results of one phase of continuing research on the costs in rubles of building Soviet merchant ships. The costs in rubles per ton of various types of ships were obtained from information contained in two recent Soviet technical books and are given in Appendixes A and B. Because this memorandum represents the first attempt at direct pricing of Soviet ships, the estimates of costs given herein should be considered preliminary.

CONTENTS

Appendixes

Tables

ESTIMATES OF COSTS IN RUBLES OF BUILDING VARIOUS TYPES OF MERCHANT SHIPS IN THE USSR*

I. Preliminary Estimates of Costs of Soviet Merchant Ships.

The pricing of the products of the shipbuilding industry of the USSR in rubles is essential to a study of the industry and is a measure of the economic effort involved in the activities of the industry. A search of recent Soviet technical literature has uncovered information on which to base costs in rubles for certain types of merchant ships. 1/** These costs are listed in Table 1.*** As indicated in this table, the preliminary costs for towed and self-propelled barges, passenger liners, steam icebreakers, and cutters, which were taken directly from the Soviet source, were probably used in making preliminary estimates of costs during the Soviet Fifth Five Year Plan (1951-55). The cost of dry cargo ships has been calculated from partial figures in the Soviet source, and the cost of tankers has been derived from a comparison with the costs of tankers and dry cargo ships in West Germany and in the US. These calculations are described in Appendixes A and B. The costs are presented as a range of values in thousands of rubles**** per metric ton/ of the light ship displacement.//

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* The estimates and conclusions contained in this memorandum represent the best judgment of ORR as of 1 February 1957.

** For serially numbered source references, see Appendix E.

*** Table 1 follows on p. 2.

**** Ruble values in this memorandum are given in terms of 1952 rubles.

/ Unless otherwise specified, tonnages throughout this memorandum are given in metric tons.

// The light ship displacement is the weight of the ship, complete, ready for service in every respect, including permanent ballast and liquids in the machinery at operating levels, but without the crew and their effects or any items of consumable or variable load such as stores, fuel, or cargo.

Table 1

USSR: Preliminary Estimates of Costs of Building Various Types of Merchant Ships

Type of Ship	Thousand 1952 Rubles per Ton Light Ship: Range	Average	Range in Percent
Towed barge	2.2 to 4.8 a/	3.5	± 37
Self-propelled barge	5.0 to 6.1 a/	5.6	± 10
Dry cargo b/	5.2 to 6.4	5.8	± 10
Tanker c/	5.0 to 6.1	5.5	± 10
Passenger liner	7.0 to 8.5 a/	7.8	± 10
Steam icebreaker	5.7 to 9.5 a/	7.6	± 25
Cutter	12 to 16 a/	14.0	± 15

a. 2/. These values, which were taken directly from the source, were probably used in making preliminary estimates of costs during the Fifth Five Year Plan.
b. See Appendix A.
c. See Appendix B.

II. Factors Contributing to the Range of Costs.

The range in costs for each type of ship results from a number of factors which are impossible to evaluate without plans and specifications of the ships. Major factors contributing to the range in costs are differences in speed, in the type of propulsion, in the number of engines, and in the interior finish. Less readily observable are differences in specifications for materials and workmanship and in standards of compartmentation. Differences in shipyard facilities available and in the productivity of shipyard workers are also important. This range in costs is normal in all countries.

III. Comparison with US Experience.

Some recent contracts to build tankers in the US are listed in Appendix C for comparison with the Soviet costs shown in Table 1.* To build tankers in the US, an average cost of about $960 per long ton light ship, plus or minus 10 percent, is indicated.

A comparison of the estimate of the cost of constructing a tanker of average size in the US with that of a somewhat similar tanker produced in the USSR yields an implied ruble-dollar ratio in 1955 of about 5.7 rubles to US $1.**

In the past 2 years, no dry cargo ships have been launched in the US which would afford a comparison of the costs of this type of ship.

* P. 2, above.

** Based on planned cost. (All dollar values in this memorandum are in terms of 1955 US dollars.)

APPENDIX A

ESTIMATED COST IN RUBLES OF A FREIGHTER BUILT IN THE USSR

Information on the labor required for the construction of a maritime dry cargo steamship of 2,000 tons full load displacement* with welded hull is shown in Table 2.

Table 2

USSR: Labor Requirements for Building a Maritime Dry Cargo Steamship of 2,000 Tons Full Load Displacement a/

Type of Work	Labor Requirements (Thousand Man-Hours)	Percent
Hull	83.0	42.0
Woodworking, painting, and rigging	11.0	5.6
Mechanical work and installation	85.0	43.0
Pipeline	12.9	6.5
Finishing and delivery	5.6	2.9
Total	197.5	100.0

a. 3/

Because the full load displacement in an average cargo ship equals 1.47 times the deadweight tonnage,** the deadweight tonnage of a 2,000-ton steamship will be 1,360 tons, and the light ship displacement will be 640 tons (2,000 minus 1,360 = 640).

* The full load displacement of a ship is the weight of the complete ship, fully loaded and ready for service in every respect.

** The deadweight tonnage of a ship is the carrying capacity of the ship in tons. It includes the crew and their effects and all items of consumable or variable load such as stores, fuel, and cargo. The deadweight tonnage is the difference in tons between the full load displacement and the light ship displacement.

The average hull structure of a cargo ship will weigh 60 percent of the light ship displacement, in this case 384 tons (640 x 0.60 = 384). Thus the man-hours required per ton are as follows:

$$\text{Man-hours per ton of light ship} = \frac{197{,}500}{\underset{\text{(tons)}}{\text{displacement}}} = 309$$

$$\text{Man-hours per ton of hull structure} = \frac{83{,}000}{384} = 216$$

With these data on the man-hours required per ton, it is possible to complete the data for a freighter of 2,600 tons light ship displacement as to distribution of weight (see Table 3) and of cost (see Table 4*). On the basis of these data the cost per ton of light ship displacement is 5,800 rubles.

Table 3

USSR: Distribution of Weight of a Dry Cargo Ship of 2,600 Tons Light Ship Displacement

Metric Tons

	Hull	Machinery	Other	Total
Weight	1,560 a/	610 a/	430	2,600
Percent	60	23.5	16.5	100

a. 4/

* Table 4 follows on p. 7.

Table 4

USSR: Distribution of Cost of a Dry Cargo Ship of 2,600 Tons Light Ship Displacement

Thousand 1952 Rubles

Expense	Hull	Machinery	Other	Total	Percent
Direct labor	1,200 a/	1,100 a/	410 b/	2,710	18
Material	2,500 a/	4,900 a/	220 b/	7,620	51
Overhead	2,420 a/	1,660 a/	530 b/	4,610	31
Miscellaneous				130 a/	
Total	6,120	7,660	1,160	15,070	100
Percent	41	51	8	100	100

a. 5/

b. These values are derived as follows:

Direct labor: Total man-hours times percentage of man-hours required for work other than on hull and machinery times average wage (800 x 15 percent x 3.4 = 410 rounded);

Material: Material cost for auxiliary work times ratio of direct labor from source 5/ ($91 \times \frac{410}{170} = 220$ rounded); and

Overhead: Overhead for auxiliary work times ratio of direct labor from source 5/ ($220 \times \frac{410}{170} = 530$ rounded).

On the basis of these figures, wages for the construction of this freighter averaged $\frac{2,710,000 \text{ rubles}}{800,000 \text{ man-hours}}$, or 3.4 rubles per man-hour.

APPENDIX B

ESTIMATED COST IN RUBLES OF A TANKER BUILT IN THE USSR

No references to the cost of Soviet tankers have been found in Soviet technical literature, but an approximate cost can be obtained by a comparison of the costs of dry cargo ships with those of tankers in the West and by the application of this ratio to the average cost of Soviet dry cargo ships. A comparison of the costs of dry cargo ships and tankers in West Germany and in the US is shown in Table 5.

Table 5

West Germany and US: Comparison of Costs of Dry Cargo Ships and Tankers

Country	Date	Type of Ship	Cost per Ton Light Ship (US $)	Ratio of Tanker to Dry Cargo
West Germany	1955 a/	Average cost of 7 dry cargo ships, 7,500 to 10,500 dwt, b/ corrected to 15 knots	525	
	1955 c/	Cost of an Esso Design-778 tanker	500	0.95
US	1939-45 d/	Average cost of the C-1, C-2, C-3, and C-4; the emergency cargo; and the victory cargo, corrected to 15 knots, 8,350 to 13,400 dwt	600	
	1939-45 d/	Average cost of T-2 and emergency tankers	561	0.94
	Average			0.945

a. 6/
b. Deadweight tons expressed as long tons.
c. 7/
d. 8/

On the basis of Table 5 an average cost of Soviet tankers would be approximately 5,500 rubles per ton light ship (0.945 times 5,800 rubles -- the average cost per ton of a Soviet dry cargo ship -- equals 5,481 rubles). The range of error is plus or minus 10 percent.

APPENDIX C

ESTIMATED COSTS IN DOLLARS OF BUILDING SUPERTANKERS IN THE US

Recently announced contracts to build supertankers in the US indicate the costs per long ton light ship shown in Table 6.

Table 6

US: Costs of Building Supertankers

Ship	Cost per Ton Light Ship (US $)
5 tankers of 33,000 to 65,000 dwt a/	860 b/
3 tankers of 60,000 dwt each	880 c/
1 tanker of 35,550 dwt	855 d/
Average	865

a. Deadweight tons expressed as long tons.
b. 9/
c. 10/
d. 11/

A recent study was made of the cost in 1955 of building tankers of the Soviet Kazbek, or Leningrad, class (12,000 dwt) in the US. 12/ This study indicated a cost plus 10 percent profit of $1,050 per long ton light ship.

The lower costs of the supertankers reflect both the absolute size of the ship and the loading in the shipyards, whereas the figure for tankers of the Kazbek, or Leningrad, class reflects a conservative estimate. It appears that an average cost per long ton for a medium-size tanker is about $960 (plus or minus 10 percent).

APPENDIX D

GAPS IN INTELLIGENCE

This memorandum is the first attempt at the direct pricing of Soviet ships and is based on rather meager information. Because important gaps still remain in the actual costs of building ships in the USSR, information which will permit refinement of the estimated costs developed in this memorandum would be useful.

APPENDIX E

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this memorandum. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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1. CIA. FDD Translation no 593, 18 Sep 56, Organization and Planning in a Shipbuilding Enterprise, by A.M. Chelnokov, 1953, p. 386. OFF USE. Eval. Doc.
   CIA. FDD U-8925, 22 Oct 56, Fundamentals of Designing Ship Repair and Shipbuilding Enterprises, by I.Ye. Getsov, 1955, p. 51. OFF USE. Eval. Doc.
2. CIA. FDD Translation no 593 (1, above).
3. CIA. FDD U-8925 (1, above).

4. CIA. FDD Translation no 593 (1, above), p. 388. OFF USE. Eval. Doc.
5. Ibid.
6. Commerce, Maritime Administration. Calculation of Foreign Cost and Construction Differential Subsidy, 17 Aug 55, p. 52, 53. S. Eval. RR 2.
7. Ibid., p. 35. S. Eval. RR 2.
8. US Maritime Commission. Statistical Summary of Shipbuilding Under the US Maritime Commission During World War II, 1949, p. 163. U. Eval. RR 2.
9. New York Times, 11 Sep 56. U. Eval. RR 2.
10. Ibid., 12 Sep 56. U. Eval. RR 2.
11. Commerce, Maritime Administration. Calculation of Foreign Cost and Construction Differential Subsidy, 17 Aug 55, p. 34 and Plate I. S. Eval. RR 2.
12. Commerce, Maritime Administration. Ship Design Division Memo, 13 Dec 56. C. Eval. RR 2.